

REMARKS

The present application was filed on July 10, 2003 with claims 1 through 21. Claims 2, 6, 10-13, 16 and 18 have been previously canceled without prejudice. Claims 10-13 had been withdrawn from consideration in response to a restriction requirement. Therefore, claims 1, 3-5, 7-9, 14, 15, 17 and 19-21 are presently pending in the above-identified patent application. Applicant herein proposes to amend claims 1, 14 and 21. Support for the amendments can be found, for example, page 8, line 7 through page 9, line 8, and page 11, lines 5-13. No new matter is being introduced.

In the Office Action, the Examiner rejected claims 1, 3-5, and 7-9 are rejected under 35 U.S.C. §101 because the claimed invention is allegedly directed to non-statutory subject matter, rejected claims 1, 3-5, 7-9, 14-15, 17, and 19-21 under 35 U.S.C. §103(a) as allegedly being unpatentable over Eisenberg et al. (Nature, volume 299, 1982, pages 371-274) (hereinafter "Eisenberg") in view of Silverman (PNA; April 24, 2001; volume 98, pages 4996-5001) (hereinafter "Silverman").

The comments of the Examiner in forming the rejections are acknowledged and have been carefully considered.

Section 101 Rejection

In the Office Action, the Examiner rejected claims 1, 3-5, and 7-9 under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter. Specifically, on page 2 of the Office Action, the Examiner stated that

[t]he method claims of the instant application (instant 1, 3-5, and 7-9) recite a series of steps without a physical transformation. Further, the claims fail to recite a tie to another statutory class of invention. It is noted that while the result of the calculation is output a user, this final step is an insignificant post-solution activity and does not constitute a significant tie to another category of invention.

Applicant, as proposed herein, has amended independent claim 1 to include a computer-implemented method for calculating a global hydrophobic moment of a tertiary protein structure comprising a plurality of residues, comprising executing, via a computer, the denoted steps. Support for the amendment can be found, for example, on page 11, lines 5-13.

As stated by the United States Court of Appeals for the Federal Circuit (*In re Bilski* (2008)), “A claimed process is surely patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing.” As such, Applicant respectfully asserts that, as amended, independent claim 1 recites a tie to a particular machine or apparatus, namely, a computer.

Additionally, Applicant submits that independent claim 1 recites a transformation of a particular article into a different state of thing. For example, claim 1 includes the limitations of enhancing correlation between residue centroid magnitude and residue solvent accessibility, using the first-order hydrophobic moment and the enhanced correlation between residue centroid magnitude and residue solvent accessibility to define the global linear hydrophobic moment, using the global linear hydrophobic moment to characterize an amphiphilicity of a tertiary protein structure, and outputting the global linear hydrophobic moment to a user.

As stated by the Federal Circuit in *Bilski*, “Thus, the transformation of that raw data into a particular visual depiction of a physical object on a display was sufficient to render that more narrowly-claimed process patent-eligible.” Applicant respectfully

asserts that the global linear hydrophobic moment is data that is being transformed into a “particular visual depiction of a physical object on a display” via the claimed step of outputting the global hydrophobic moment to a user.

Further, the Federal Circuit in *Bilski* also stated, “We further note for clarity that the electronic transformation of the data itself into a visual depiction in [*In re*] *Abele* [684 F.2d 902 (CCPA 1982)] was sufficient; the claim was not required to involve any transformation of the underlying physical object that the data represented.” Similarly, Applicant submits that independent claim 1 discloses an electronic transformation of data into a visual depiction, and as such, is patentable subject matter.

Therefore, Applicant respectfully asserts that independent claim 1, as amended, overcomes the §101 rejection. Also, Applicant further submits that by virtue of their dependence on allowable independent claim 1, claims 3-5 and 7-9, respectively, are directed to statutory subject matter in their own right.

Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1, 3-5, and 7-9 under 35 U.S.C. §101.

Section 103(a) Rejection

The Examiner also rejected claims 1, 3-5, 7-9, 14, 15, 17 and 19-21 under 35 U.S.C. §103(a) as allegedly being unpatentable over Eisenberg in view of Silverman. With regard to the §103 rejections, Applicant initially notes that a proper *prima facie* case of obviousness requires that the cited references when combined must “teach or suggest all the claim limitations,” and that there be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references or to modify the reference teachings. See MPEP §706.02(j). Therefore, as an initial matter, Applicant respectfully submits that the cited combination of references does not teach or suggest all of the limitations of the claims.

Beginning on page 7 of the Office Action, the Examiner states that

Applicant argues that Silverman does not teach or suggest the limitation of enhancing correlation between residue centroid magnitude and residue solvent accessibility..... This is not persuasive because, as discussed above, while Silverman teaches residue centroids, Eisenberg uses centers of residues (at alpha carbons) to calculate the first order hydrophobic moments (using distances) with magnitudes plotted on the

ordinate axis of Figure 2 of Eisenberg et al. Using this ordinate coordinate and the curve illustrated in Figure 2, one of skill in the art can calculate the hydrophobicity [] of the helix []. Silverman expands this analysis for calculating the zero order linear hydrophobic moment for an entire protein.

Applicant respectfully submits that the references cited by the Examiner merely note using solvent accessibility in a first order moment equation; however the references do not teach or suggest achieving this while enhancing correlation to solvent accessibility. For example, as noted above, in explaining why Applicant's argument that Silverman does not teach or suggest the limitation of enhancing correlation between residue centroid magnitude and residue solvent accessibility is not persuasive, the Examiner states that "Eisenberg uses centers of residues (at alpha carbons) to calculate the first order hydrophobic moments (using distances) with magnitudes plotted on the ordinate axis of Figure 2 of Eisenberg et al. Using this ordinate coordinate and the curve illustrated in Figure 2, one of skill in the art can calculate the hydrophobicity [] of the helix []." However, as was previously established, for example, on page 8 of the previous Office Action, the Examiner conceded that

Eisenberg et al. does not show correlation enhancement between residue centroid magnitude and solvent accessibility....

As such, Applicant respectfully asserts that because, as has been established, Eisenberg does not show correlation enhancement between residue centroid magnitude and solvent accessibility, an argument based in the teachings of Eisenberg to teach the same limitation cannot be accepted as grounds for unpatentability. Additionally, further stating that "Silverman expands this analysis for calculating the zero order linear hydrophobic moment for an entire protein" does not speak to the limitation in question either (that is, enhancing correlation between residue centroid magnitude and residue solvent accessibility).

Consequently, Applicant argues that the cited Silverman reference does not teach or suggest the limitation of enhancing correlation between residue centroid magnitude and residue solvent accessibility, wherein the correlation between residue centroid magnitude and residue solvent accessibility is enhanced using a distance metric. In addition, as a matter of practicality, the cited Silverman reference also does not teach the

limitation of using the first-order hydrophobic moment and the enhanced correlation between residue centroid magnitude and residue solvent accessibility to define the global linear hydrophobic moment.

As a result, Applicant respectfully submits that the combination of references
5 does not teach or suggest the limitations in question, and therefore, that the §103 rejection is improper. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Also, Applicant submits that the cited references do not teach or suggest the
10 limitation of each residue centroid having a same fractional distance to a surface of the tertiary protein structure contributes an equivalent magnitude to the global linear hydrophobic moment by mapping each residue at a same distance from a center of the protein structure, as included in amended claims 1, 14 and 21. Support for the amendment can be found, for example, on page 8, line 7 through page 9, line 8 of the
15 specification.

By way of example, as stated beginning on page 8, line 18 of the specification,

For example, distances from the center of the protein to two
residues at different locations on the same ellipsoid, e.g., residing on the
same ellipsoidal surface, are denoted by arrows 1 and 3 in FIG. 2. Even
20 though the two residues are at the same fractional distance to the protein surface, the distance from the origin is different. The two residues would therefore make different contributions to the magnitude of the vector.... This difference can be corrected based on a spatial linear moment of each
25 residue by mapping the ellipsoidal coordinates onto a sphere with radius equal to the major principal axis. Both locations are then mapped to the positions designated by arrows 2 and 4 in FIG. 2.

Applicant submits that the cited combination of references does not teach or
suggest the noted limitation now included in amended independent claims 1, 14 and 21.
30 Further, as stated on page 9, lines 17-18 of the specification, "residue centroid magnitude differences which are not representative of residue solvent accessibility may be corrected for."

Additionally, Applicant asserts that there is inadequate motivation to combine the two references. On page 8 of the Office Action, the Examiner reiterates that

5 [i]t would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify the helical hydrophobic moment study of Eisenberg et al. by use of the hydrophobic moment study of Silverman wherein the motivation would have been that using residue centroids instead of atomic points yields a more ideal overall shape and moment of the protein (see first full paragraph of column 1 on page 4998 of Silverman).

10 Applicants submit that these explanations are conclusory statements of the sort rejected by both the Federal Circuit and the U.S. Supreme Court. See *KSR v. Teleflex*, 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (U.S., Apr. 30, 2007), quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of
15 obviousness.”).

Applicant submits that Silverman does not speak of atomic points, and as a result, Silverman does not offer motivation to modify the helical hydrophobic moment study of Eisenberg (which uses atomic points).

20 Additionally, as previously noted, Eisenberg teaches a measure of the amphiphilicity of a segment of a secondary protein structure (that is, a helix). See, Eisenberg, title. As such, a person of ordinary skill in the art would not be motivated to combine the Eisenberg reference with the Silverman reference, which does not teach measuring amphiphilicity of a helix but rather spatial transition of the hydrophobicity from the interior to the exterior of a protein. See, Silverman, page 4996, right column,
25 second paragraph. Consequently, Applicant respectfully submits that the combination of references is improper, and therefore, that the §103 rejection is improper.

As noted herein, Applicant respectfully asserts that independent claims 1, 14 and
21 overcome the rejection as allegedly unpatentable over the references cited in this rejection. Also, Applicant further submits that by virtue of their dependence on
30 independent claims 1 and 14, claims 3-5, 7-9 and 15, 17-20, respectively recite patentable subject matter in their own right. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, Applicant respectfully requests withdrawal of the §103(a) rejection from claims 1, 3-5, 7-9, 14, 15, 17 and 19-21.

All of the pending claims, i.e., claims 1, 3-5, 7-9, 14, 15, 17 and 19-21, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,



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